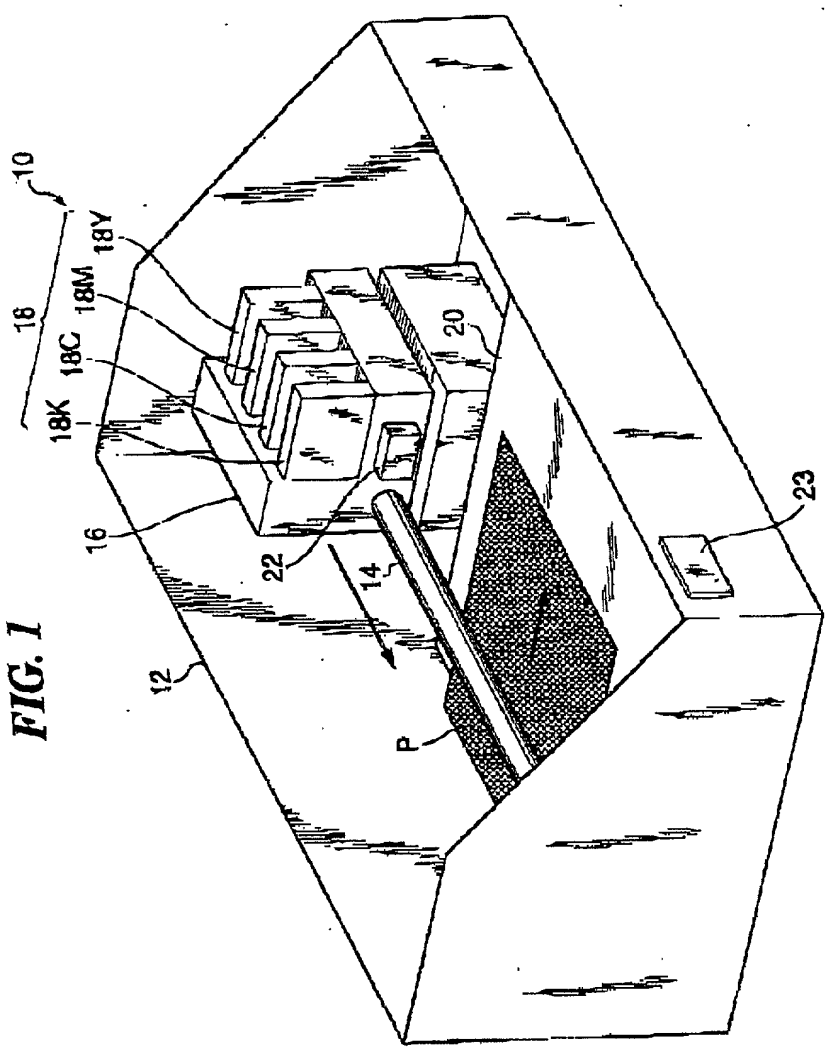


FIG. 1

FIG. 2

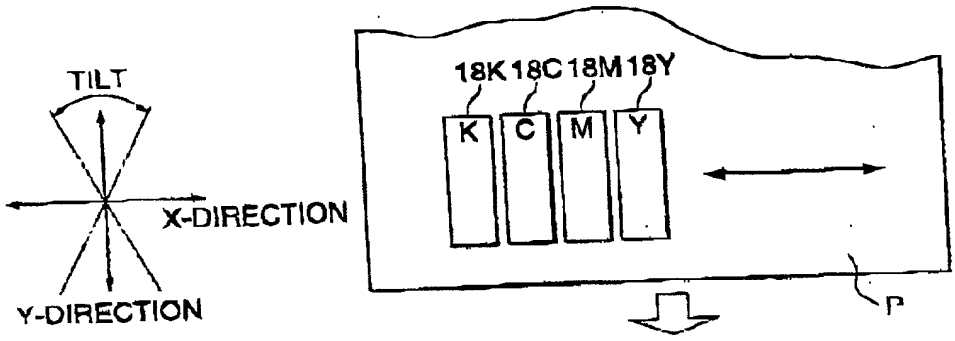
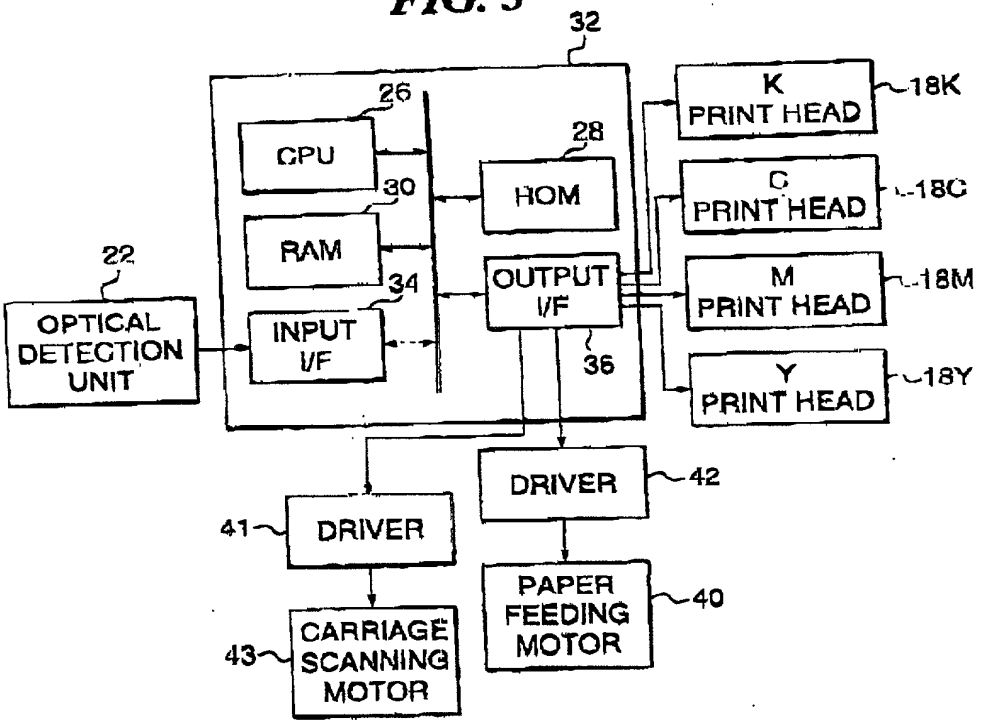

TILT
X-DIRECTION
Y-DIRECTION
18K 18C 18M 18Y
K
C
M
Y
P

FIG. 3


32
26
CPU
28
ROM
30
RAM
34
INPUT I/F
OUTPUT I/F
36
22
OPTICAL DETECTION UNIT
K PRINT HEAD
18K
C PRINT HEAD
18C
M PRINT HEAD
18M
Y PRINT HEAD
18Y
DRIVER
42
41
DRIVER
PAPER FEEDING MOTOR
40
43
CARRIAGE SCANNING MOTOR

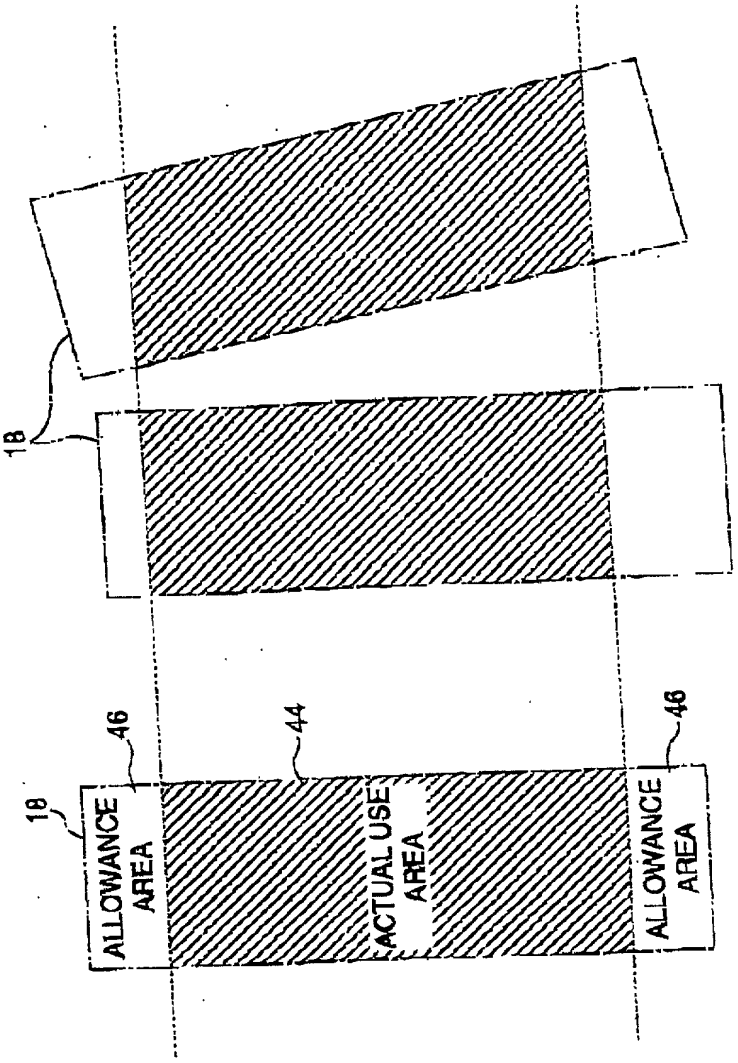


FIG. 4

FIG. 5

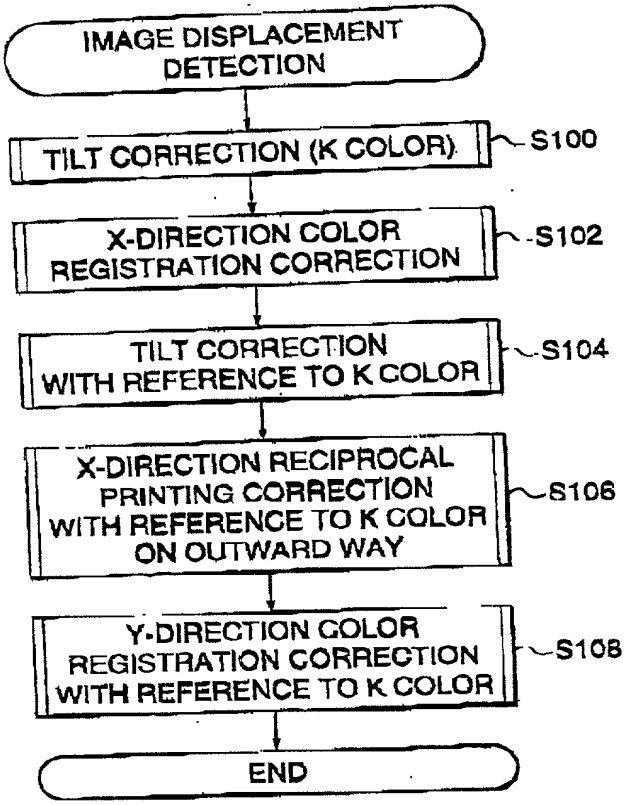


IMAGE DISPLACEMENT DETECTION
TILT CORRECTION (K COLOR)
S100
X-DIRECTION COLOR REGISTRATION CORRECTION
S102
TILT CORRECTION WITH REFERENCE TO K COLOR
S104
X-DIRECTION RECIPROCAL PRINTING CORRECTION WITH REFERENCE TO K COLOR ON OUTWARD WAY
S106
Y-DIRECTION COLOR REGISTRATION CORRECTION WITH REFERENCE TO K COLOR
S108
END

FIG. 6A

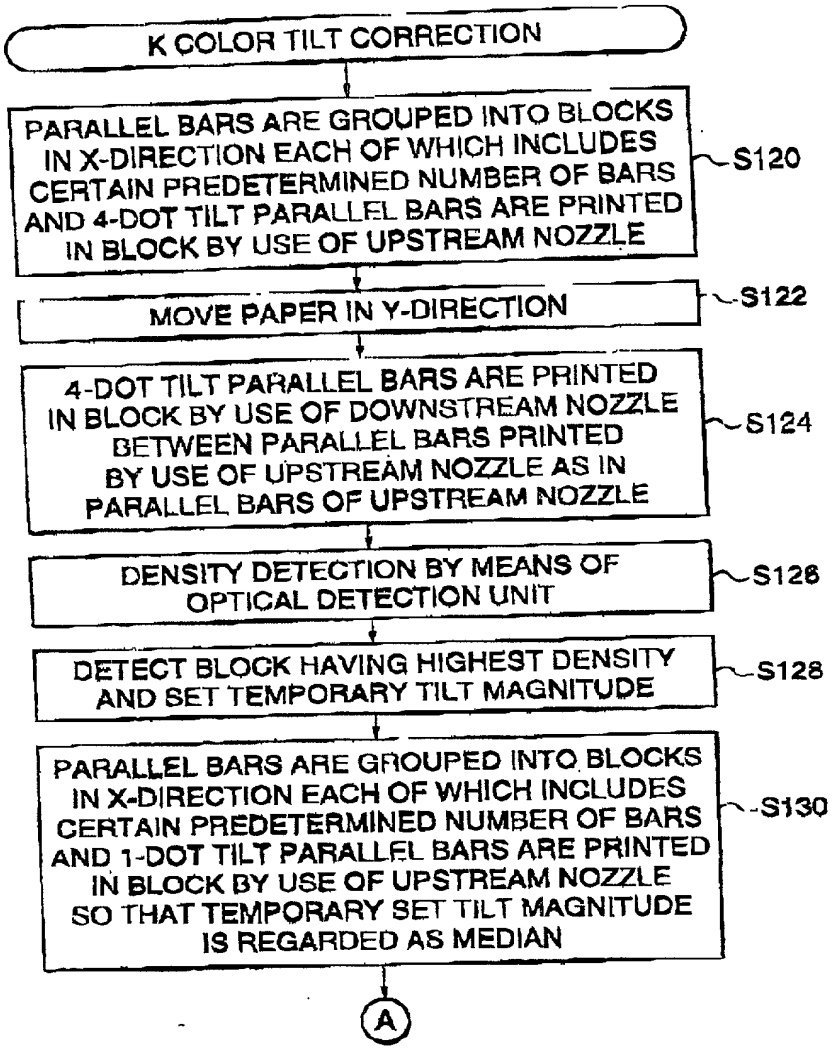
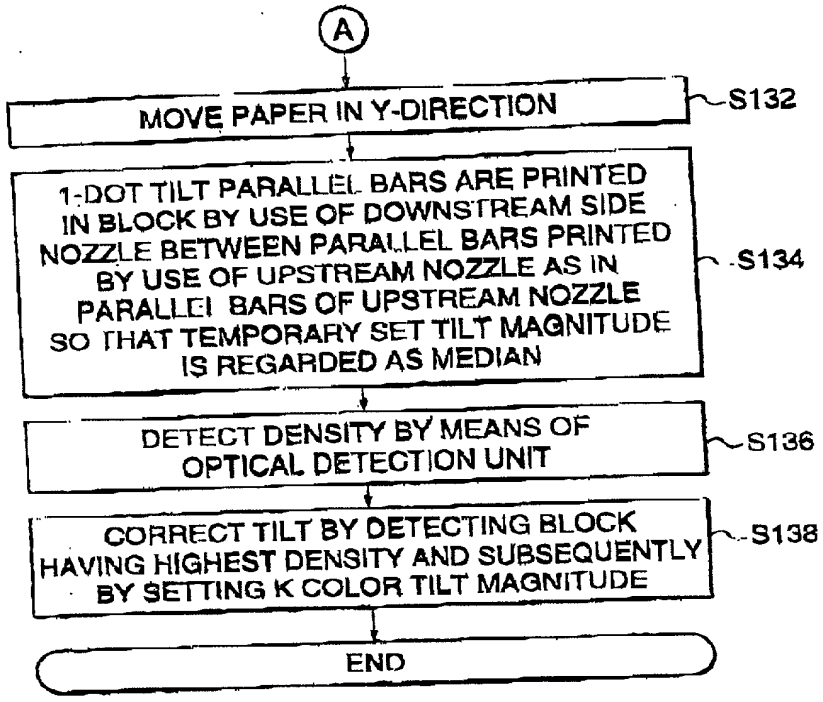

K COLOR TILT CORRECTION
PARALLEL BARS ARE GROUPED INTO BLOCKS IN X-DIRECTION EACH OF WHICH INCLUDES CERTAIN PREDETERMINED NUMBER OF BARS AND 4-DOT TILT PARALLEL BARS ARE PRINTED IN BLOCK BY USE OF UPSTREAM NOZZLE
S120
MOVE PAPER IN Y-DIRECTION
S122
4-DOT TILT PARALLEL BARS ARE PRINTED IN BLOCK BY USE OF DOWNSTREAM NOZZLE BETWEEN PARALLEL BARS PRINTED BY USE OF UPSTREAM NOZZLE AS IN PARALLEL BARS OF UPSTREAM NOZZLE
S124
DENSITY DETECTION BY MEANS OF OPTICAL DETECTION UNIT
S126
DETECT BLOCK HAVING HIGHEST DENSITY AND SET TEMPORARY TILT MAGNITUDE
S128
PARALLEL BARS ARE GROUPED INTO BLOCKS IN X-DIRECTION EACH OF WHICH INCLUDES CERTAIN PREDETERMINED NUMBER OF BARS AND 1-DOT TILT PARALLEL BARS ARE PRINTED IN BLOCK BY USE OF UPSTREAM NOZZLE SO THAT TEMPORARY SET TILT MAGNITUDE IS REGARDED AS MEDIAN
S130
A

FIG. 6B


A
MOVE PAPER IN Y-DIRECTION
S132
1-DOT TILT PARALLEL BARS ARE PRINTED IN BLOCK BY USE OF DOWNSTREAM SIDE NOZZLE BETWEEN PARALLEL BARS PRINTED BY USE OF UPSTREAM NOZZLE AS IN PARALLEI BARS OF UPSTREAM NOZZLE SO THAT TEMPORARY SET TILT MAGNITUDE IS REGARDED AS MEDIAN
S134
DETECT DENSITY BY MEANS OF OPTICAL DETECTION UNIT
S136
CORRECT TILT BY DETECTING BLOCK HAVING HIGHEST DENSITY AND SUBSEQUENTLY BY SETTING K COLOR TILT MAGNITUDE
S138
END

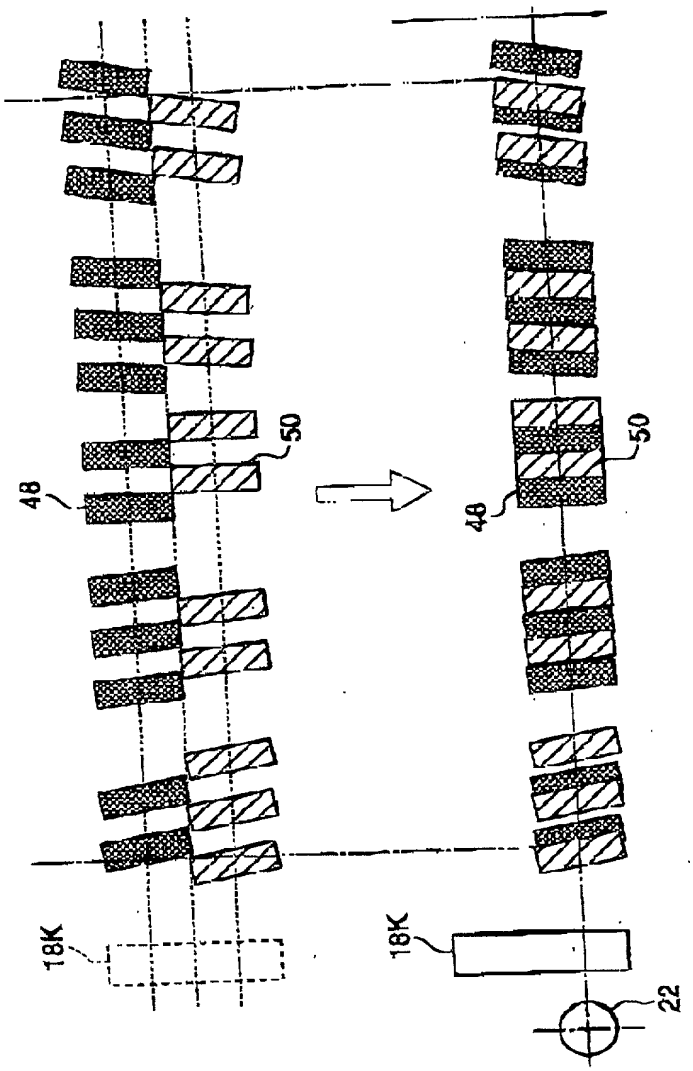


FIG. 7

FIG. 8A

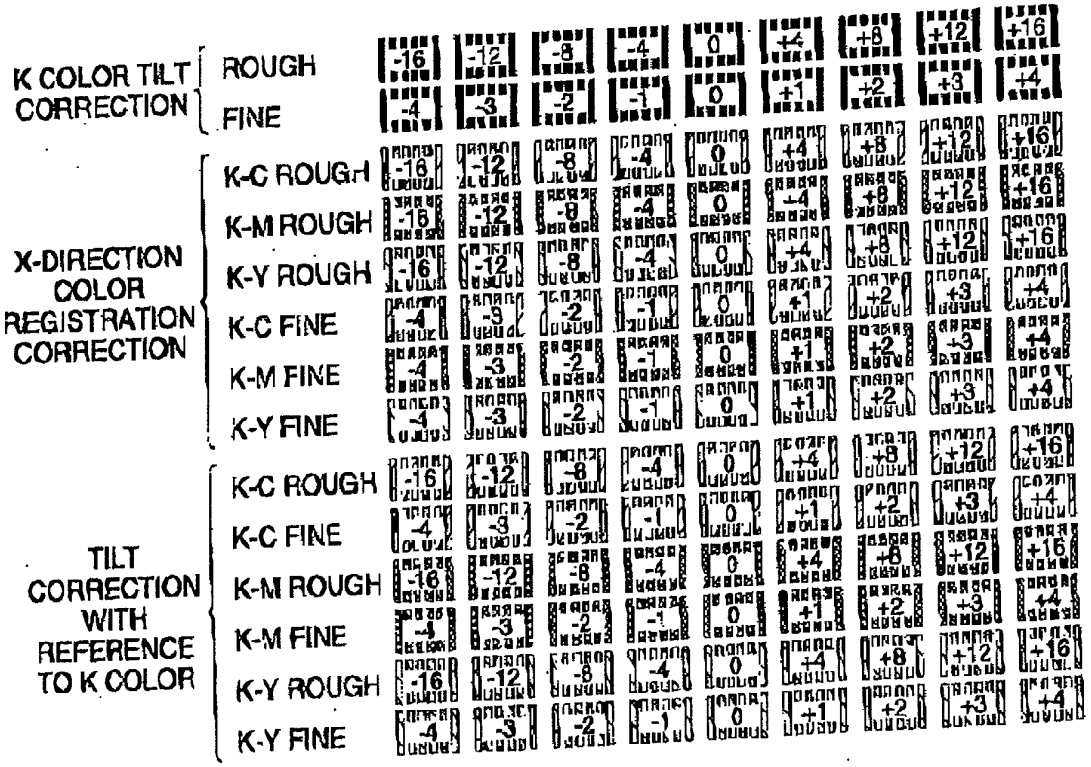

K COLOR TILT CORRECTION
ROUGH
FINE
X-DIRECTION COLOR REGISTRATION CORRECTION
K-C ROUGH
K-M ROUGH
K-Y ROUGH
K-C FINE
K-M FINE
K-Y FINE
TILT CORRECTION WITH REFERENCE TO K COLOR
K-C ROUGH
K-C FINE
K-M ROUGH
K-M FINE
K-Y ROUGH
K-Y FINE

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FIG. 8B

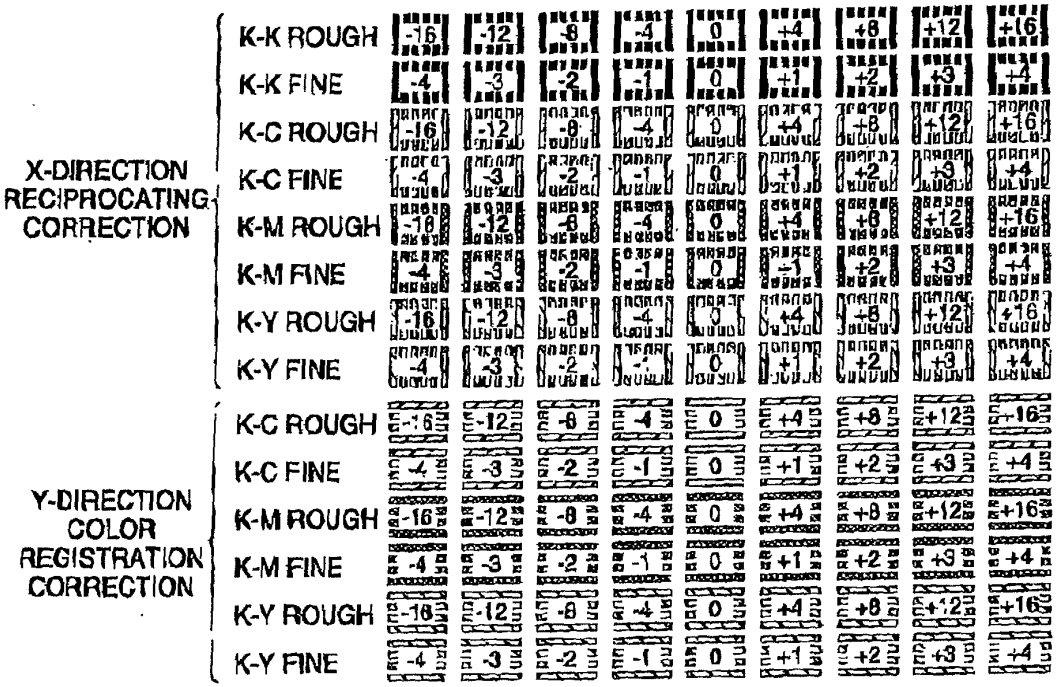


FIG. 9A

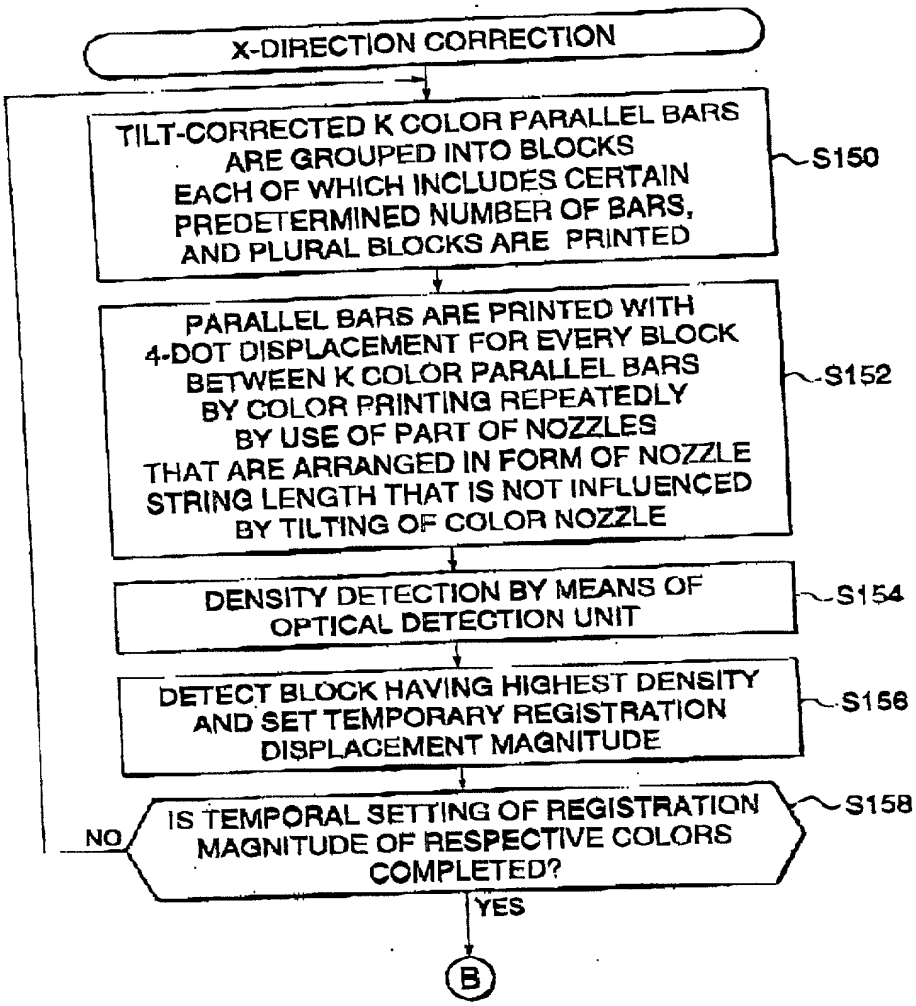

X-DIRECTION CORRECTION
TILT-CORRECTED K COLOR PARALLEL BARS ARE GROUPED INTO BLOCKS EACH OF WHICH INCLUDES CERTAIN PREDETERMINED NUMBER OF BARS, AND PLURAL BLOCKS ARE PRINTED
S150
PARALLEL BARS ARE PRINTED WITH 4-DOT DISPLACEMENT FOR EVERY BLOCK BETWEEN K COLOR PARALLEL BARS BY COLOR PRINTING REPEATEDLY BY USE OF PART OF NOZZLES THAT ARE ARRANGED IN FORM OF NOZZLE STRING LENGTH THAT IS NOT INFLUENCED BY TILTING OF COLOR NOZZLE
S152
DENSITY DETECTION BY MEANS OF OPTICAL DETECTION UNIT
S154
DETECT BLOCK HAVING HIGHEST DENSITY AND SET TEMPORARY REGISTRATION DISPLACEMENT MAGNITUDE
S156
IS TEMPORAL SETTING OF REGISTRATION MAGNITUDE OF RESPECTIVE COLORS COMPLETED?
S158
NO
YES
B

FIG. 9B

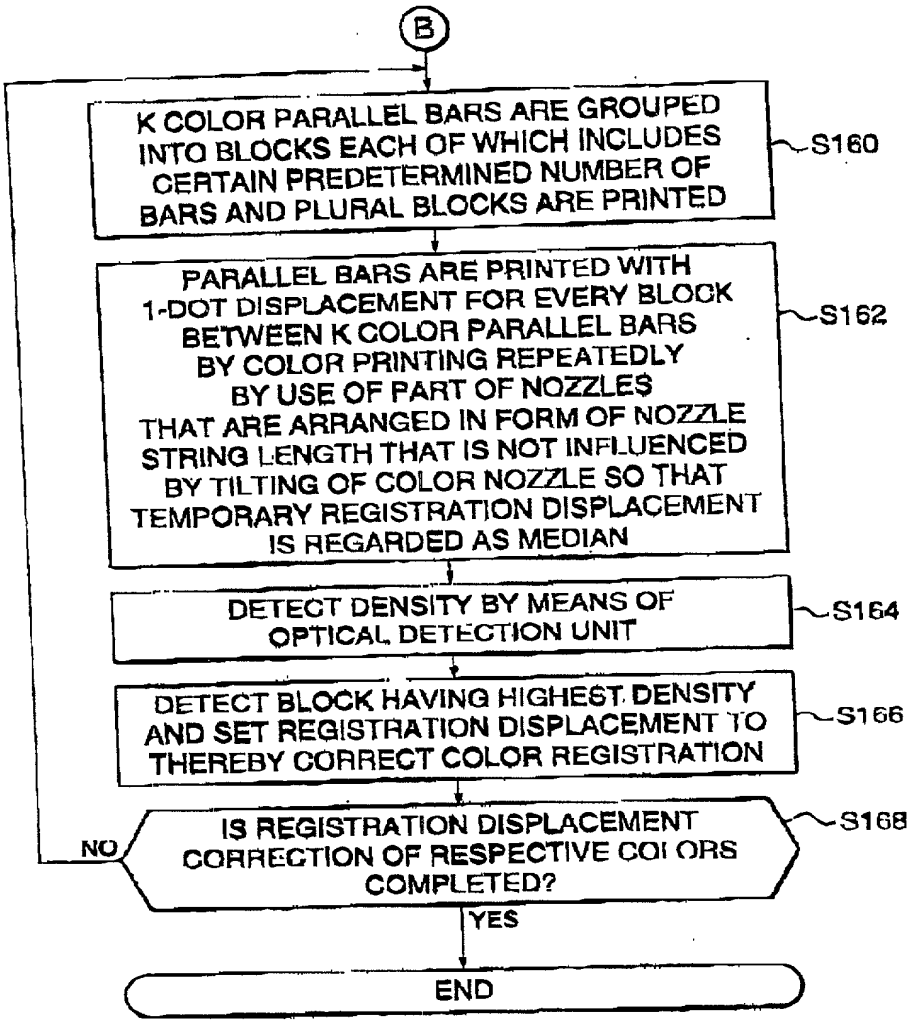

B
K COLOR PARALLEL BARS ARE GROUPED INTO BLOCKS EACH OF WHICH INCLUDES CERTAIN PREDETERMINED NUMBER OF BARS AND PLURAL BLOCKS ARE PRINTED
S160
PARALLEL BARS ARE PRINTED WITH 1-DOT DISPLACEMENT FOR EVERY BLOCK BETWEEN K COLOR PARALLEL BARS BY COLOR PRINTING REPEATEDLY BY USE OF PART OF NOZZLES THAT ARE ARRANGED IN FORM OF NOZZLE STRING LENGTH THAT IS NOT INFLUENCED BY TILTING OF COLOR NOZZLE SO THAT TEMPORARY REGISTRATION DISPLACEMENT IS REGARDED AS MEDIAN
S162
DETECT DENSITY BY MEANS OF OPTICAL DETECTION UNIT
S164
DETECT BLOCK HAVING HIGHEST DENSITY AND SET REGISTRATION DISPLACEMENT TO THEREBY CORRECT COLOR REGISTRATION
S166
IS REGISTRATION DISPLACEMENT CORRECTION OF RESPECTIVE COLORS COMPLETED?
S168
NO
YES
END

FIG. 10

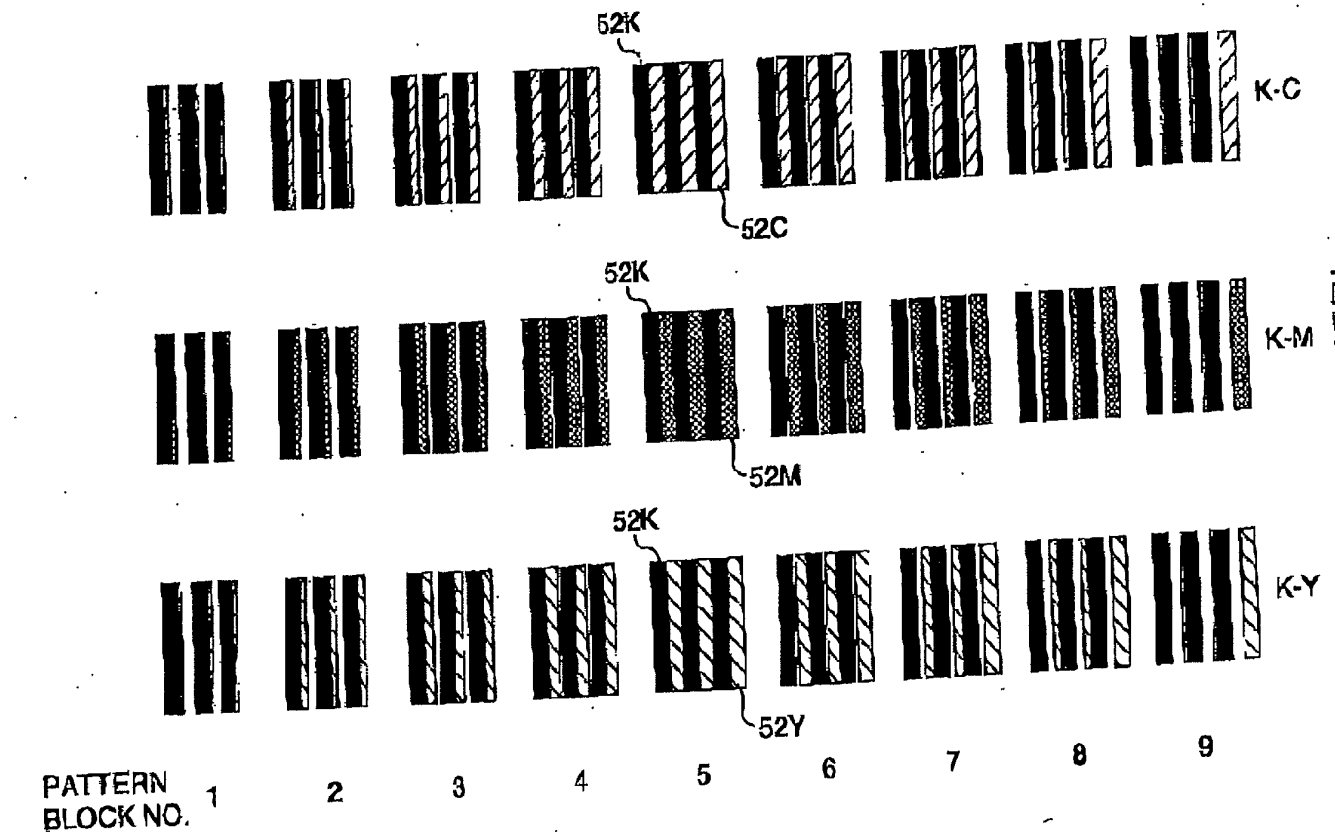


FIG. 11

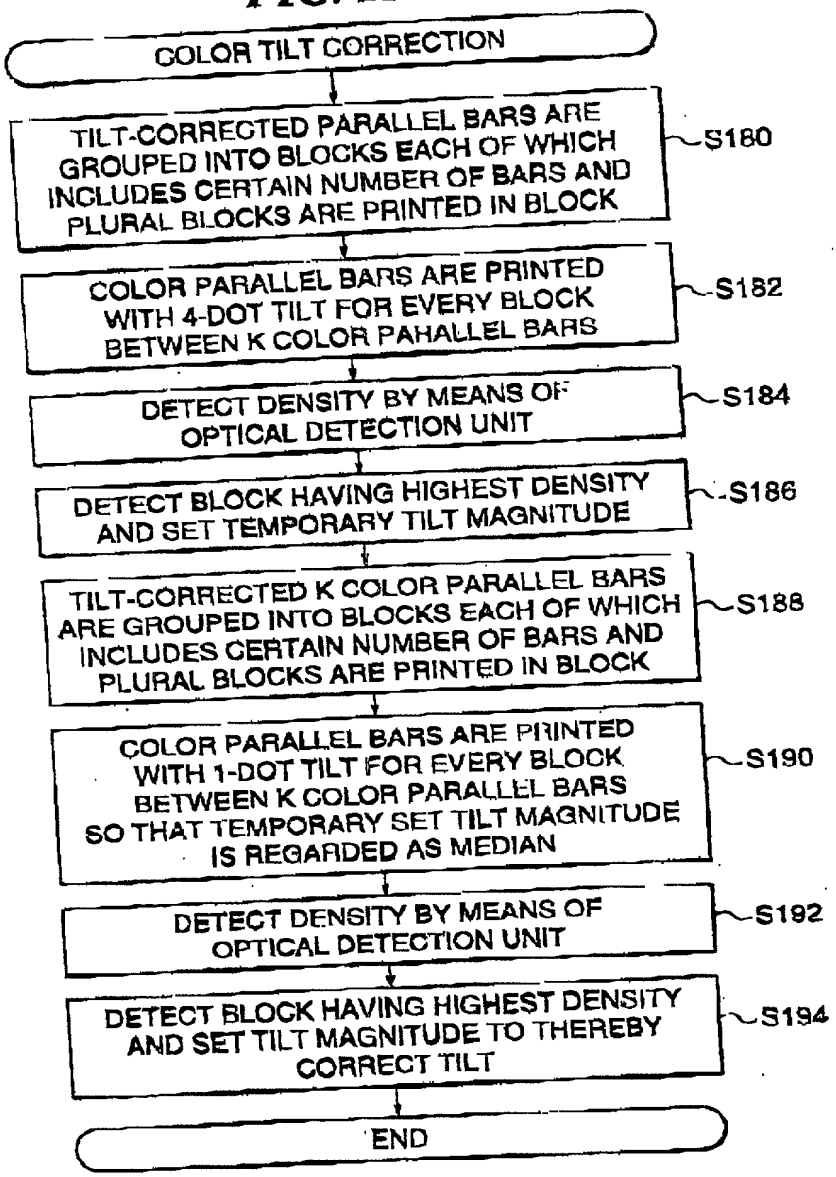

COLOR TILT CORRECTION
TILT-CORRECTED PARALLEL BARS ARE GROUPED INTO BLOCKS EACH OF WHICH INCLUDES CERTAIN NUMBER OF BARS AND PLURAL BLOCKS ARE PRINTED IN BLOCK
S180
COLOR PARALLEL BARS ARE PRINTED WITH 4-DOT TILT FOR EVERY BLOCK BETWEEN K COLOR PAHALLEL BARS
S182
DETECT DENSITY BY MEANS OF OPTICAL DETECTION UNIT
S184
DETECT BLOCK HAVING HIGHEST DENSITY AND SET TEMPORARY TILT MAGNITUDE
S186
TILT-CORRECTED K COLOR PARALLEL BARS ARE GROUPED INTO BLOCKS EACH OF WHICH INCLUDES CERTAIN NUMBER OF BARS AND PLURAL BLOCKS ARE PRINTED IN BLOCK
S188
COLOR PARALLEL BARS ARE PRINTED WITH 1-DOT TILT FOR EVERY BLOCK BETWEEN K COLOR PARALLEL BARS SO THAT TEMPORARY SET TILT MAGNITUDE IS REGARDED AS MEDIAN
S190
DETECT DENSITY BY MEANS OF OPTICAL DETECTION UNIT
S192
DETECT BLOCK HAVING HIGHEST DENSITY AND SET TILT MAGNITUDE TO THEREBY CORRECT TILT
S194
END

FIG. 12

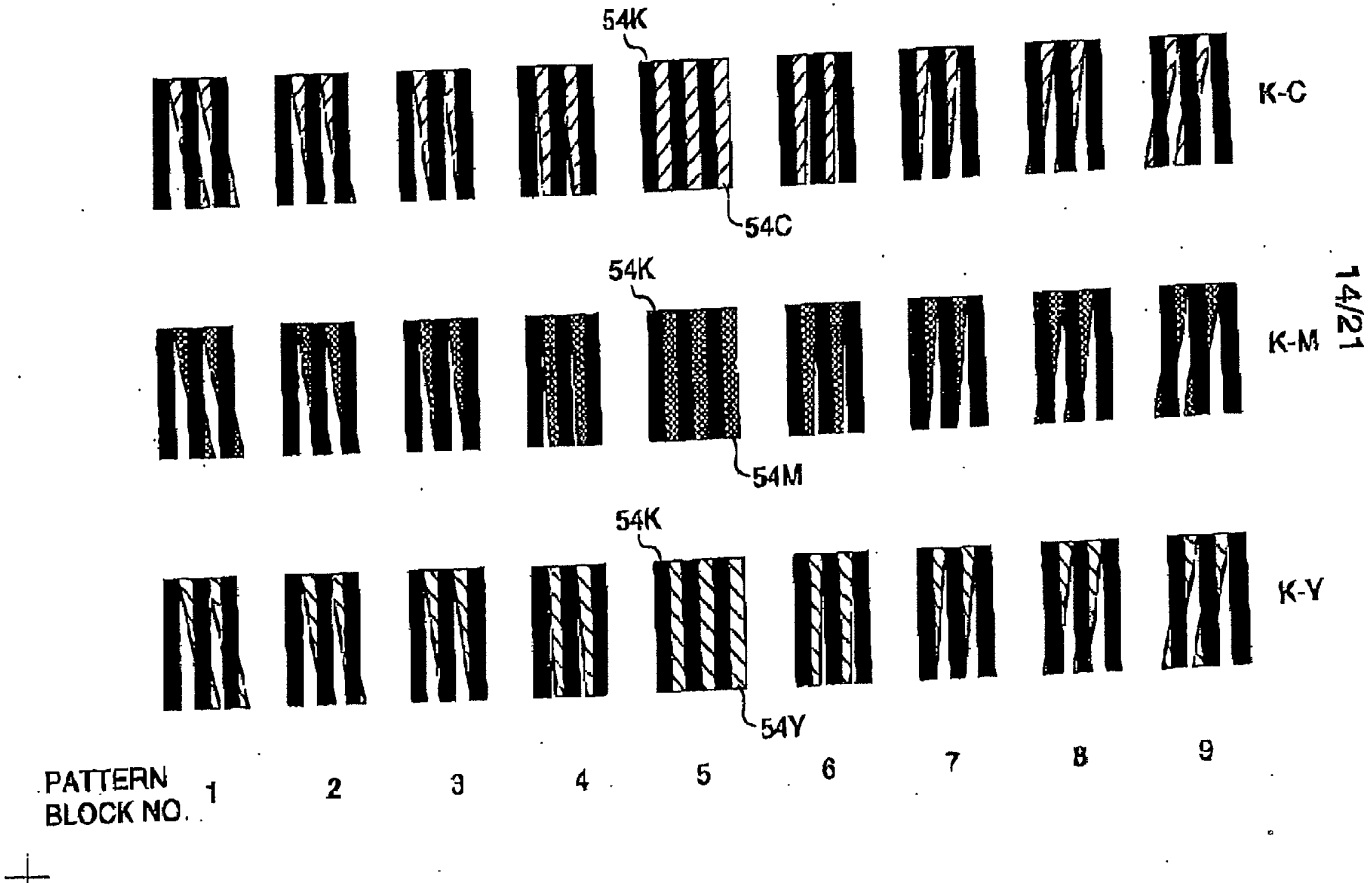


FIG. 13
PRIOR ART

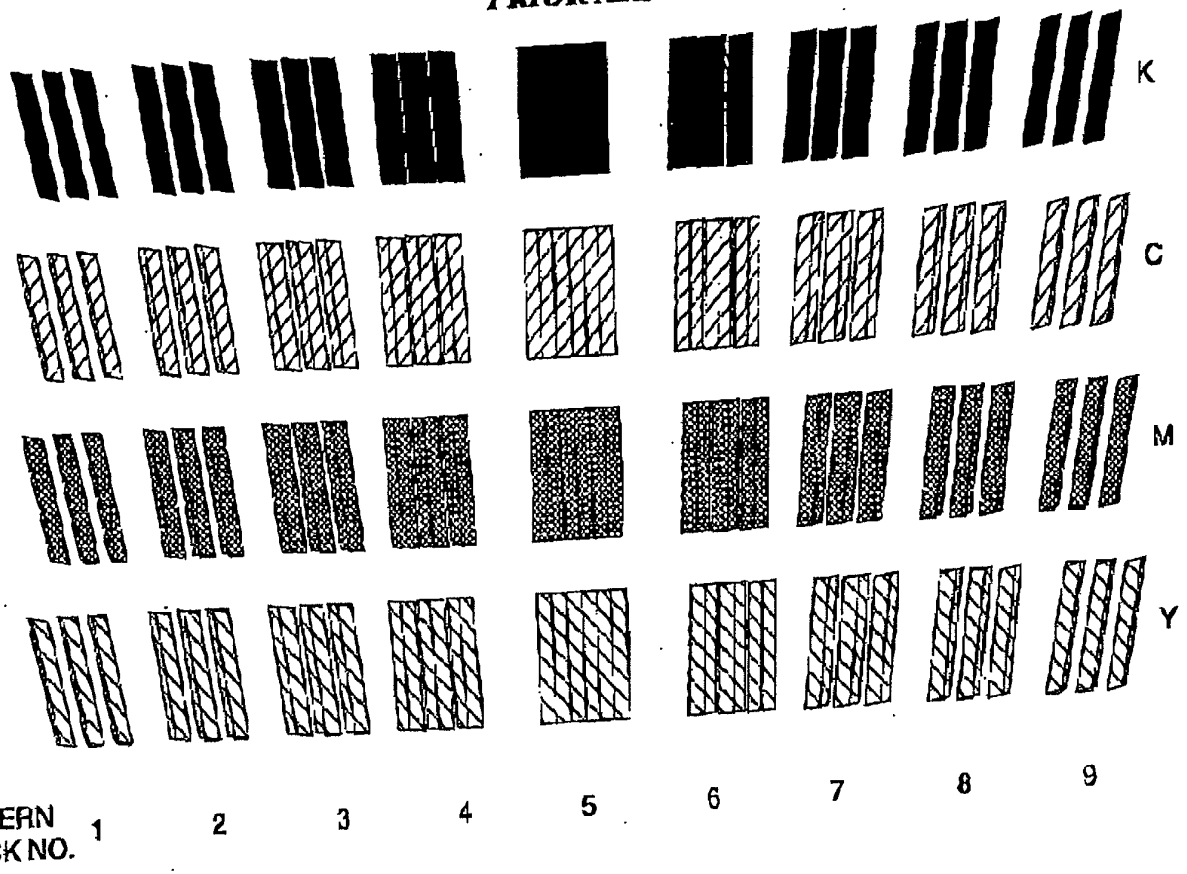


FIG. 14
PRIOR ART

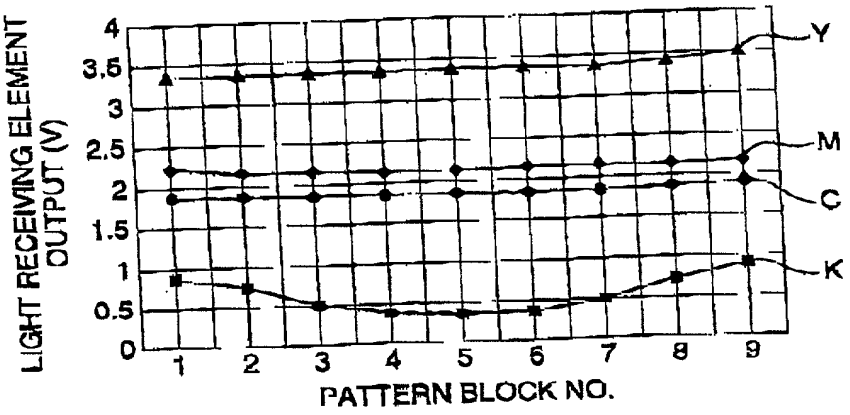


FIG. 15

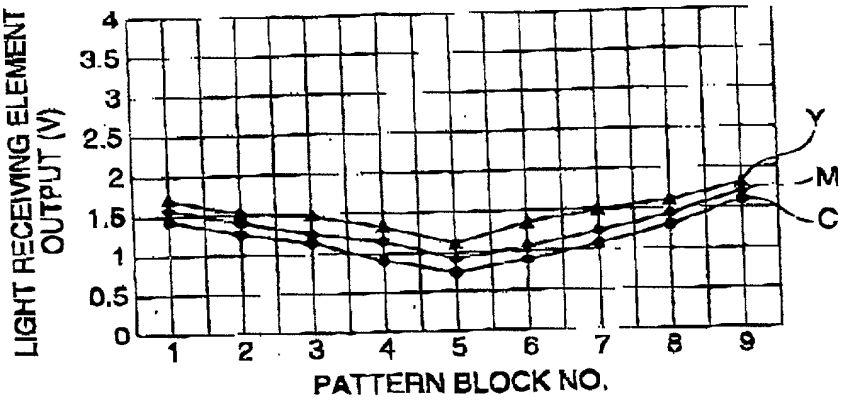
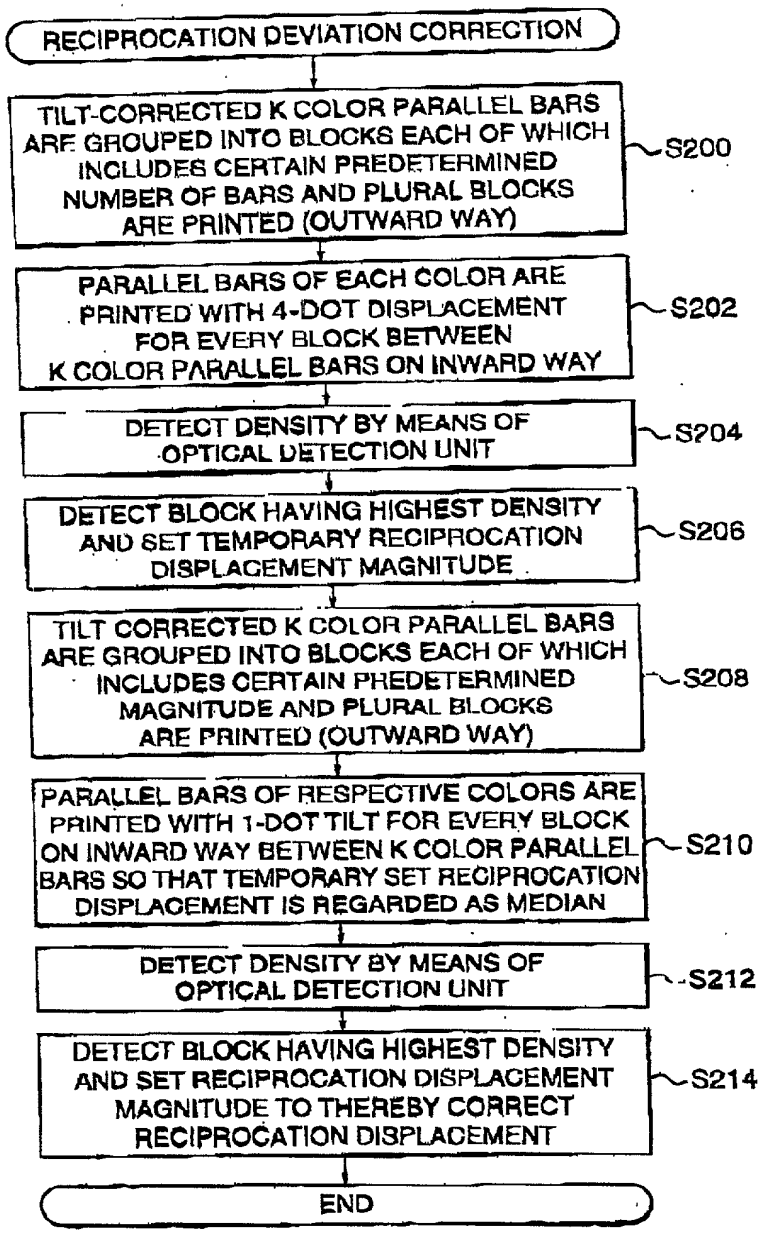


FIG. 16


RECIPROCATION DEVIATION CORRECTION
TILT-CORRECTED K COLOR PARALLEL BARS ARE GROUPED INTO BLOCKS EACH OF WHICH INCLUDES CERTAIN PREDETERMINED NUMBER OF BARS AND PLURAL BLOCKS ARE PRINTED (OUTWARD WAY)
S200
PARALLEL BARS OF EACH COLOR ARE PRINTED WITH 4-DOT DISPLACEMENT FOR EVERY BLOCK BETWEEN K COLOR PARALLEL BARS ON INWARD WAY
S202
DETECT DENSITY BY MEANS OF OPTICAL DETECTION UNIT
S204
DETECT BLOCK HAVING HIGHEST DENSITY AND SET TEMPORARY RECIPROCATION DISPLACEMENT MAGNITUDE
S206
TILT CORRECTED K COLOR PARALLEL BARS ARE GROUPED INTO BLOCKS EACH OF WHICH INCLUDES CERTAIN PREDETERMINED MAGNITUDE AND PLURAL BLOCKS ARE PRINTED (OUTWARD WAY)
S208
PARALLEL BARS OF RESPECTIVE COLORS ARE PRINTED WITH 1-DOT TILT FOR EVERY BLOCK ON INWARD WAY BETWEEN K COLOR PARALLEL BARS SO THAT TEMPORARY SET RECIPROCATION DISPLACEMENT IS REGARDED AS MEDIAN
S210
DETECT DENSITY BY MEANS OF OPTICAL DETECTION UNIT
S212
DETECT BLOCK HAVING HIGHEST DENSITY AND SET RECIPROCATION DISPLACEMENT MAGNITUDE TO THEREBY CORRECT RECIPROCATION DISPLACEMENT
S214
END

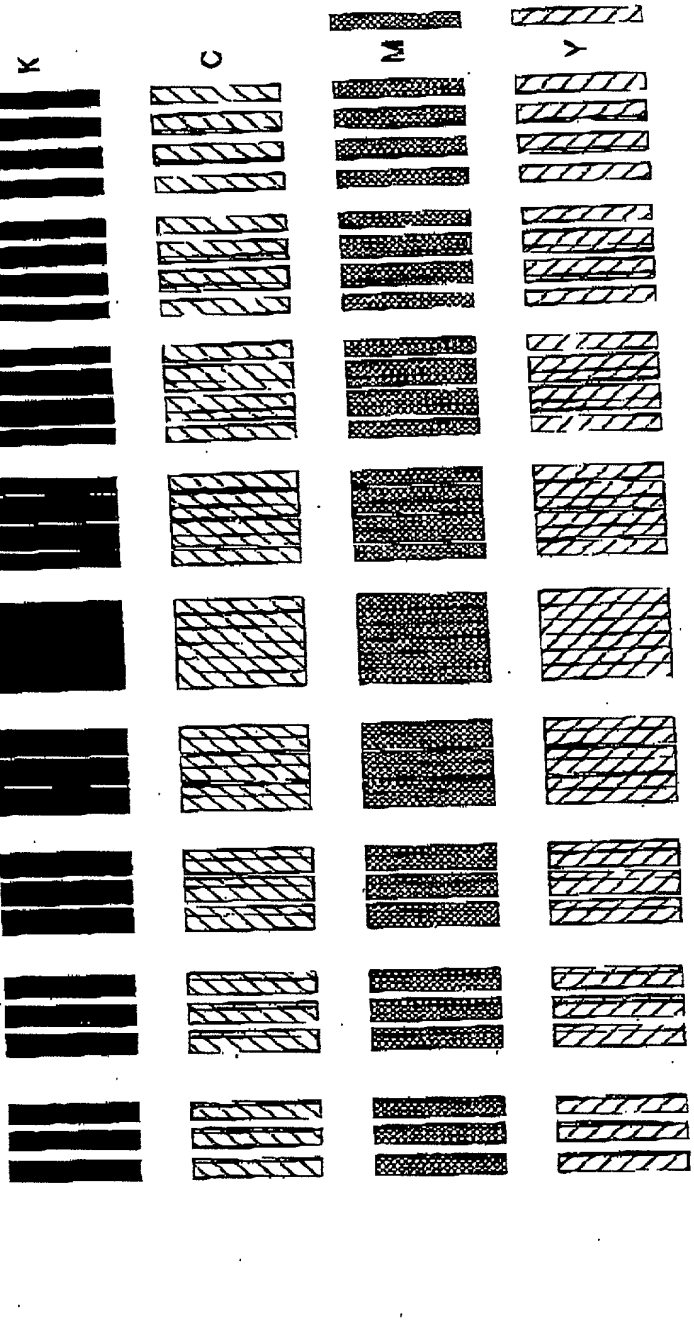


FIG. 17
PRIOR ART

FIG. 18
PRIOR ART

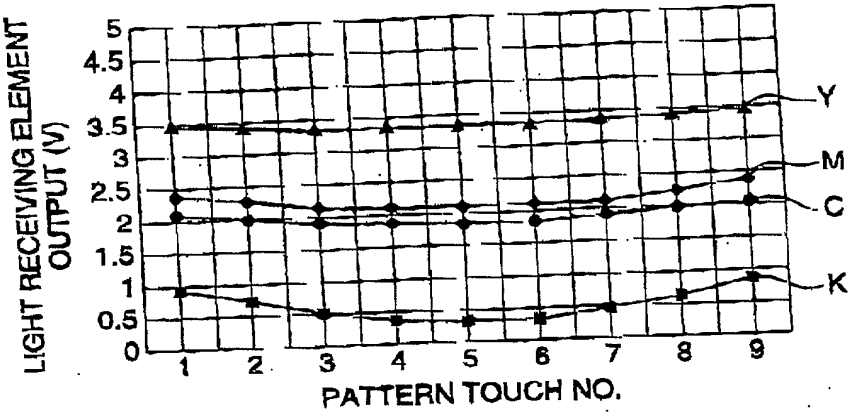


FIG. 19

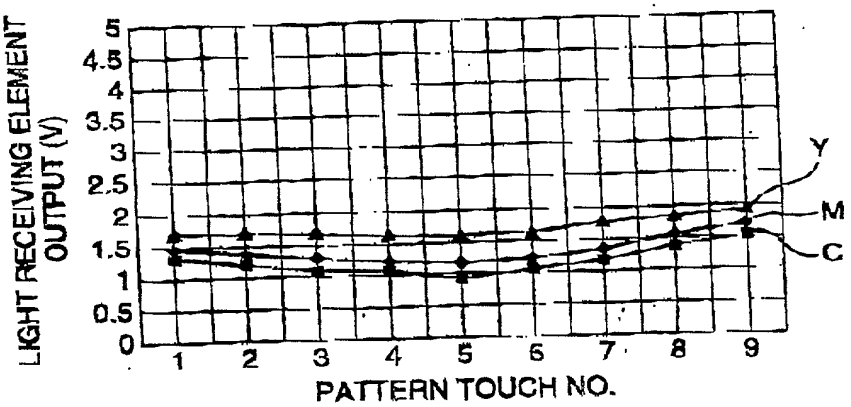


FIG. 20

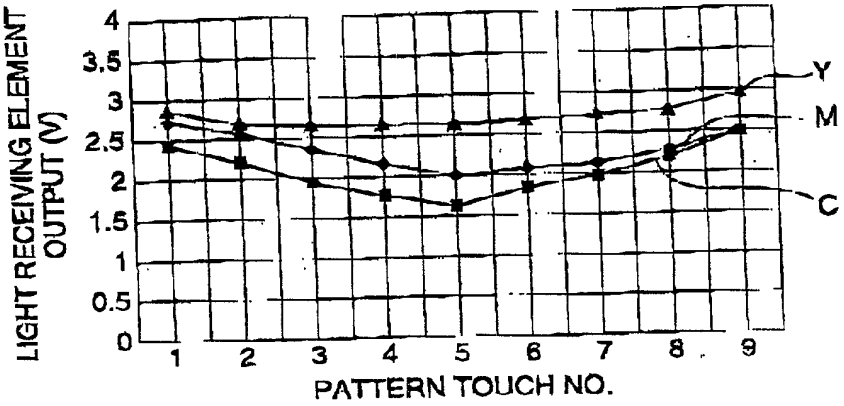
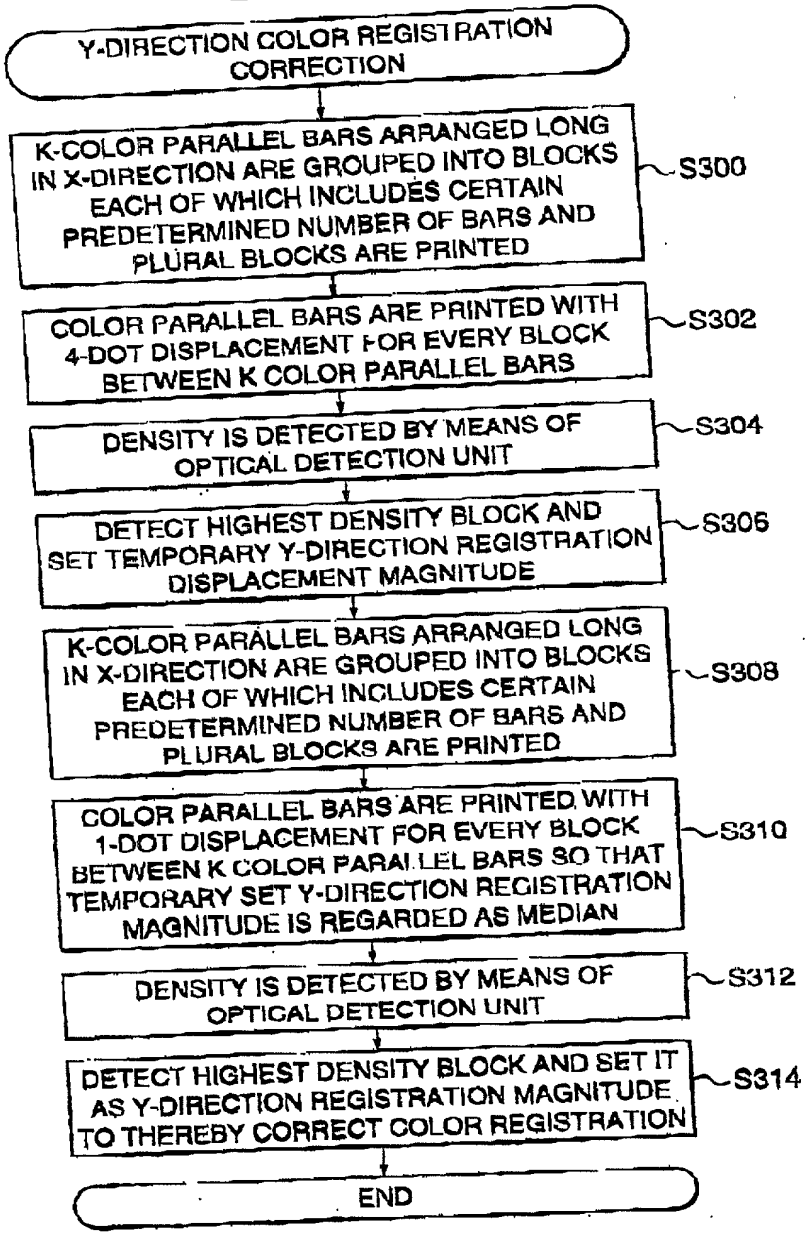

LIGHT RECEIVING ELEMENT OUTPUT (V)
4
3.5
3
2.5
2
1.5
1
0.5
0
1
2
3
4
5
6
7
8
9
PATTERN TOUCH NO.
Y
M
C

FIG. 21


Y-DIRECTION COLOR REGISTRATION CORRECTION
K-COLOR PARALLEL BARS ARRANGED LONG IN X-DIRECTION ARE GROUPED INTO BLOCKS EACH OF WHICH INCLUDES CERTAIN PREDETERMINED NUMBER OF BARS AND PLURAL BLOCKS ARE PRINTED
S300
COLOR PARALLEL BARS ARE PRINTED WITH 4-DOT DISPLACEMENT FOR EVERY BLOCK BETWEEN K COLOR PARALLEL BARS
S302
DENSITY IS DETECTED BY MEANS OF OPTICAL DETECTION UNIT
S304
DETECT HIGHEST DENSITY BLOCK AND SET TEMPORARY Y-DIRECTION REGISTRATION DISPLACEMENT MAGNITUDE
S306
K-COLOR PARALLEL BARS ARRANGED LONG IN X-DIRECTION ARE GROUPED INTO BLOCKS EACH OF WHICH INCLUDES CERTAIN PREDETERMINED NUMBER OF BARS AND PLURAL BLOCKS ARE PRINTED
S308
COLOR PARALLEL BARS ARE PRINTED WITH 1-DOT DISPLACEMENT FOR EVERY BLOCK BETWEEN K COLOR PARALLEL BARS SO THAT TEMPORARY SET Y-DIRECTION REGISTRATION MAGNITUDE IS REGARDED AS MEDIAN
S310
DENSITY IS DETECTED BY MEANS OF OPTICAL DETECTION UNIT
S312
DETECT HIGHEST DENSITY BLOCK AND SET IT AS Y-DIRECTION REGISTRATION MAGNITUDE TO THEREBY CORRECT COLOR REGISTRATION
S314
END